

LISTING OF CLAIMS:

Please amend the claims as follows. This Listing of Claims supersedes all previous versions of the claims.

1-22. (Canceled).

23. (Currently Amended) ~~The semiconductor memory device according to claim 22;~~
A semiconductor memory device including a plurality of transistors, wherein each of the transistors comprises:

a semiconductor layer of a first conduction type and electrically isolated from other memory cells such that it is floating;

a drain diffusion region of a second conduction type, formed in the first conduction-type semiconductor layer, and connected to a bit line;

a source diffusion region of the second conduction type, formed apart from the drain diffusion region in the first conduction-type semiconductor layer, and connected to a source line; and

a gate electrode formed on the semiconductor layer between the drain diffusion region and the source diffusion region with a gate insulator therebetween, and forms a word line,

wherein the transistor has a first data state having a first threshold voltage in which excessive majority carriers are held in the semiconductor layer and a second data state having a second threshold voltage in which the excessive majority carriers in the semiconductor layer are emitted,

wherein the bit line is one of a plurality of bit lines, a sense amplifier being provided for the plurality of bit lines, one of the bit lines being selected to be connected to the sense amplifier, and

wherein the first data state is a state in which impact ionization is generated near a drain junction by operating the transistor and in which excessive majority carriers produced by this impact ionization are held in the semiconductor layer, and the second data state is a state in which a forward bias is applied between the semiconductor layer and the drain diffusion region to extract the excessive majority carriers from within the semiconductor layer to the drain diffusion region.

24. (Currently Amended) The semiconductor memory device according to claim 2223, wherein the semiconductor layer is a silicon layer formed on a silicon substrate with an insulating film therebetween.

25. (Previously Presented) The semiconductor memory device according to claim 24, wherein the silicon layer is a p-type, and the transistor is an N-channel MOS transistor.

26. (Currently Amended) The semiconductor memory device according to claim 2223, wherein a voltage of the source line is constant.

27. (Currently Amended) ~~The semiconductor memory device according to claim 26;~~
A semiconductor memory device including a plurality of transistors, wherein each of the transistors comprises:

a semiconductor layer of a first conduction type and electrically isolated from other memory cells such that it is floating;

a drain diffusion region of a second conduction type, formed in the first conduction-type semiconductor layer, and connected to a bit line;

a source diffusion region of the second conduction type, formed apart from the drain diffusion region in the first conduction-type semiconductor layer, and connected to a

source line; and

a gate electrode formed on the semiconductor layer between the drain diffusion region and the source diffusion region with a gate insulator therebetween, and forms a word line,

wherein the transistor has a first data state having a first threshold voltage in which excessive majority carriers are held in the semiconductor layer and a second data state having a second threshold voltage in which the excessive majority carriers in the semiconductor layer are emitted,

wherein the bit line is one of a plurality of bit lines, a sense amplifier being provided for the plurality of bit lines, one of the bit lines being selected to be connected to the sense amplifier

wherein a voltage of the source line is constant, and

wherein when data is written, with the source line as a reference voltage,

a first voltage higher than the reference voltage is given to ~~a~~the word line of a selected transistor~~one of the transistors,~~

a second voltage lower than the reference voltage is given to ~~a~~the word line of a non-selected transistor~~one of the transistors,~~

a third voltage higher than the reference voltage is given to the bit line when the first data state is written, and

a fourth voltage lower than the reference voltage is given to the bit line when the second data state is written.

28. (Previously Presented) The semiconductor memory device according to claim 27, wherein when the data is read, with the source line as the reference voltage, a fifth voltage, which is between the first threshold voltage and the second threshold voltage and higher than the reference voltage, is given to the word line of the selected transistor to detect whether the selected transistor conducts.

29. (Previously Presented) The semiconductor memory device according to claim 27, wherein when the data is read, with the source line as the reference voltage, a fifth voltage, which is higher than the first and second threshold voltages and higher than the reference voltage, is given to the word line of the selected transistor to detect a conductivity of the selected transistor.

30. (Previously Presented) The semiconductor memory device according to claim 27, wherein when the data is read, after the voltage of the word line is raised more than the second threshold voltage, a predetermined current is supplied to the bit line to detect a potential difference in the bit line.

31. (Previously Presented) The semiconductor memory device according to claim 27, wherein when the data is read, after the voltage of the word line is raised more than the second threshold voltage, a current is supplied to the bit line to clamp the voltage thereof at a predetermined voltage and to detect a difference in the supplied current.

32. (Canceled).

33. (Currently Amended) The semiconductor memory device according to claim ~~32~~35, wherein the transistors, each having a cell size of $2F \times 2F$ where F is a minimum feature size, are arranged in ~~a~~the matrix form.

34. (Currently Amended) The semiconductor memory device according to claim ~~32~~35, wherein the drain diffusion region and the source diffusion region are formed sufficiently deep to reach the insulating film located under the silicon layer.

35. (Currently Amended) ~~The semiconductor memory device according to claim 32,~~
A semiconductor memory device, comprising:
an SOI substrate in which a silicon layer is formed on an insulating film formed
on a silicon substrate;
a plurality of transistors which have drain diffusion regions and source diffusion
regions formed in the silicon layer and gate electrodes formed on the silicon layer, wherein pairs
of the transistors, each pair sharing one of the drain diffusion regions, being arranged in a matrix
form and element-isolated in a channel width direction, wherein the gate electrodes of the
transistors arranged in a first direction are continuously formed so as to form word lines; and
a plurality of bit lines running in a second direction intersecting the first direction
and connected to the drain diffusion regions of the transistors;
wherein each of the transistors has a first data state having a first threshold
voltage in which excessive majority carriers are held in the silicon layer and a second data state
having a second threshold voltage in which the excessive majority carriers in the silicon layer are
emitted,
wherein a sense amplifier is provided for the plurality of bit lines, one of the bit
lines being selected to be connected to the sense amplifier, and
wherein the first data state is a state in which impact ionization is generated near a
drain junction by operating the transistor and in which excessive majority carriers produced by
this impact ionization are held in the silicon layer, and the second data state is a state in which a
forward bias is applied between the silicon layer and the drain diffusion region to extract the
excessive majority carriers from within the silicon layer to the drain diffusion region.

36. (Currently Amended) The semiconductor memory device according to claim
3235, wherein the silicon layer is a p-type, and the transistor is an N-channel MOS transistor.

37. (Currently Amended) The semiconductor memory device according to claim ~~3235~~, wherein a voltage of the source diffusion regions is constant.

38. (Currently Amended) The semiconductor memory device according to claim 37, wherein when data is written, with the source diffusion regions as a reference voltage,
a first voltage higher than the reference voltage is given to ~~a~~ the word line of ~~the~~ a selected ~~transistor~~ one of the transistors,
a second voltage lower than the reference voltage is given to ~~a~~ the word line of ~~the~~ a non-selected ~~transistor~~ one of the transistors,
a third voltage higher than the reference voltage is given to the bit line when the first data state is written, and
a fourth voltage lower than the reference voltage is given to the bit line when the second data state is written.

39. (Previously Presented) The semiconductor memory device according to claim 38, wherein when the data is read, with the source diffusion regions as the reference voltage, a fifth voltage, which is between the first threshold voltage and the second threshold voltage and higher than the reference voltage, is given to the word line of the selected transistor to detect whether the selected transistor conducts.

40. (Previously Presented) The semiconductor memory device according to claim 38, wherein when the data is read, with the source diffusion regions as the reference voltage, a fifth voltage, which is higher than the first and second threshold voltages and higher than the reference voltage, is given to the word line of the selected transistor to detect a conductivity of the selected transistor.

41. (Currently Amended) The semiconductor memory device according to claim 3235, wherein when the data is read, after a voltage of ~~a~~the word line of ~~the~~a selected transistor ~~one of the transistors~~ is raised more than the second threshold voltage, a predetermined current is supplied to ~~a~~the bit line of the selected transistor to detect a potential difference in the bit line thereof.

42. (Currently Amended) The semiconductor memory device according to claim 3235, wherein when the data is read, after a voltage of ~~a~~the word line of ~~the~~a selected transistor ~~one of the transistors~~ is raised more than the second threshold voltage, a current is supplied to ~~a~~the bit line of the selected transistor to clamp the voltage thereof at a predetermined voltage and to detect a difference in the supplied current.

43. (Currently Amended) The semiconductor memory device according to claim 38, wherein when the data is read, after a voltage of ~~a~~the word line of ~~the~~a selected transistor ~~one of the transistors~~ is raised more than the second threshold voltage, a predetermined current is supplied to ~~a~~the bit line of the selected transistor to detect a potential difference in the bit line thereof.

44. (Currently Amended) The semiconductor memory device according to claim 38, wherein when the data is read, after a voltage of ~~a~~the word line of ~~the~~a selected transistor ~~one of the transistors~~ is raised more than the second threshold voltage, a current is supplied to ~~a~~the bit line of the selected transistor to clamp the voltage thereof at a predetermined voltage and to detect a difference in the supplied current.